

## Induction of Labor Prevalence and Associated Factors for Its Outcome at Wolliso St. Luke, Catholic Hospital, South West Shewa, Oromia

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### Abstract

**Background:** Over recent decades, more pregnant women around the world have undergone labor induction to deliver their babies. In developing countries up to 25% of all deliveries at term now involve induction of labor, but in some developing countries the rate are generally lower. Induction is indicated when the benefits to either the mother or the fetus outweigh those of continuing the pregnancy.

**Objective:** To determine the prevalence of labor induction and factors associated to the outcome of induced labor at Wolliso St. Luke, catholic Hospital, South west Ethiopia.

**Methods:** Institutional based retrospective cross-sectional study design was conducted to describe the prevalence of labor induction, and factors associated with its outcome. Logistic regression analysis Bivariate and multivariate logistic regression were employed to assess the relative effect of determinants and statistical tests were used to see the associations.

**Result:** A total of 340 delivery record was reviewed. Out of this 76 (22.4%) of women undergone induction of labor with a success rate of 44 (57.89%). In logistic regression analysis gestational age, Bishop Score, fetal heart beats, membrane rupture before induction of labor and APGAR score showed significant association to the success of induced labor.

**Conclusion:** The finding indicated that the prevalence of induced labor in study area was a bit lower compared to developed countries. The success rate is low that need improvement, so as address the problems related to the outcomes of induced labor. Furthermore the associated risk factors also due attention to prevent further complication.

**Keywords:** Induction; Labor; Retrospective study; Risk factor; Pregnancy; Gestational age

Africa region evidenced by only 3% of women had an induction of labor in Nigeria hospital [7].

### Background

Induction of labor is defined as iatrogenic stimulation of uterine contractions to cause the delivery of fetus before the onset of spontaneous labor. Labor is typically induced by using one of the following methods: Cervical ripening agents, artificial rupture of membranes, and uterine stimulation with oxytocin [1].

Induction of labor with the goal of achieving vaginal delivery prior to spontaneous onset of labor is recommended when the benefits of delivery out-weigh the risk of continuing the pregnancy [2].

Major indication for induction of labor includes maternal, fetal, social or combination of these factors. These indications may also either be evident or anticipated [3]. Rates of induction of labor vary from region to region.

In the United States of America and the United kingdom, about 23% of all deliveries are by induction of labor [4,5] while 11.4% was reported in Latin America [6]. Rate of induction labor are low in some

Induction of labor is directly relevant to health related millennium development goals (MDGs). It has potentials for preventing maternal complication and improving pregnancy outcomes. Beyond 41 weeks of gestation, the number of routine induction of labor needed to prevent one fetal or neonatal death decreases constantly [8].

An increases rate of induction of labor for post term pregnancies over 15 years period was associated with decreased still birth rate in Canada [9]. Africa has the highest maternal mortality as well as highest still birth and potential mortality rates [10].

In area with a high rate of maternal mortality and morbidity due to poor access to comprehensive emergency obstetric care (CEMOC) knowing the prevalence, indications and pregnancy outcome following inductions of labor is crucial. Therefore this study is aimed at providing information on prevalence, associated factors and outcomes of inductions of labor in Wolliso St. Luke's Hospital which helps to reduce the rate of maternal mortality and morbidity resulting from complications related with pregnancies that need emergency terminations of pregnancy.

## Materials and Methods

### Study settings and design

Facility based, retrospective cross sectional study was conducted in Wolliso St. Luke hospital from November 1, 2014 up to October 30; 2015 on mothers who gave birth in Wolliso hospital during the study period. Wolliso St. Luke's Hospital is located in south west shoa zone of oromia regional state at a distance of 114 km from Addis Ababa. The total catchment population is about 1.2 million people.

### Study population

All pregnant women who gave birth after 28 weeks of gestation age in the Wolliso St. Luke. Hospital and selected as study. Mothers who gave birth after 28 weeks of gestation, singlet on and vertex presentation in Wolliso St. Luke Hospital.

**Sample size determination and sampling technique:** The sample size of this study was calculated by using cochrans sample size formula based on the prevalence rate taken from the previous study (6.8%)

$$n = \frac{(Z^2 * P(1 - p))}{E^2}$$

[11].

$$Z=1.96, P=0.068, E=0.03$$

Where, n is the sample size, Z tabulated value from standard normal distribution with the desired confidence level (95%), E is the desired level of precision; P is the estimated proportion (6.8%). Based on this information, the total sample size required for this study was 270. To make the study more sound the sample size was goes up to 340 from chart of mother who deliver in the study hospital. The lost card will be substitute by the next subsequent number

### Study variables

#### Dependent variables

The dependent variable of this study is prevalence of induced labor and its outcomes.

#### Independent variables

Maternal demographic factors (age, residential), Methods of induction used (amniotomy, intravenous oxytocin drip, misoprostol), Health indication for IOL (PROM, DM, postdate, cardiac disease, pre-eclampsia), Obstetric history (parity, gravidity, ANC follow-up) taken as independent variable.

### Data collection method

Using the labor ward delivery logbook the record from November 1, 2014 up to October 30, 2015 were retrieved and about 340 study units were obtained by using systematic sampling methods. Then data was collected using structured check list. One BSC nurse as a supervisor and four diploma midwifery as data collectors were participated in the data collection process. The intensive training was given to the data collectors and supervisor.

### Methods of data analysis

Data was first check manually for completeness, coded and entered to SPSS version 16.0 for analysis. Some of variables were categorized

for analysis purpose. Both descriptive and inferential statistical data analysis methods are employee in this study accordingly.

### Ethical considerations

Ethical clearance was obtained from ethical committee of Jimma University College of public health and medical science post graduate research program and letter of cooperation was obtained from JUSH administrative office.

Permission was sought from the hospital authorities for data collection. All information obtained from patients' card was anonymous and the patient's name is not included in the check list.

## Results

### Socio-demographic characteristics

A total of 340 women's document was reviewed in delivery unit log book at Wolliso St. Luke hospital that was registered from November 1, 2014 up to October 30, 2015 G.C. Among 340 about 76 (22.4%) laboring mothers were undergone inductions of labor.

More than half of the women 200 (58.8%) visited the unit was found in the age group greater than 24 years. Majority of the women 216 (63.5%) attended the delivery service were rural dweller (Table 1).

Variable	Frequency	Percentage (%)
Age of the women		
<24	140	41.20%
>24	200	58.80%
Residence		
Urban	124	36.50%
Rural	216	63.50%

**Table 1:** Socio demographic characteristics of the study in Wolliso St. Luke Hospital from November 1, 2014 to October 30, 2015.

### Obstetrical history

About 90% of laboring mother had ANC follow-up during their pregnancy. More than two-third the study subject were Multigravida. According to their gestational age, majority of the women that accounts about 187 (55%) was unknown LNMP followed by 128 (37.64%) of gestational age less than or equal to 42 weeks.

As of modified bishop Score, about 314 (92.4%) was greater than 5. There were different reasons for induction of labor, of this PROM takes the largest share that account about 35.5% followed by post term, pregnancy induced hypertension (PIH) and IUFD at a rate of 27.6%, 21.0% and 15.8% respectively (Table 2).

### Outcomes of labor

Among the total 340 delivery data reviewed in the log book from following delivery the most common maternal complication was tear that accounts 37 (10.9%). Above 95% of new born were alive at birth with 308 (90.6%) APGAR score greater than 7. Nearly 96% new born weights less than 4000 gm. Only few numbers of new born 17 (5%) at

birth were admitted to NICU. In addition there was no perinatal death registered in 94.1% of the cases (Table 3).

Variables	Frequency	Percentage (%)
Mode of delivery		
Spontaneous vaginal delivery	44	57.89
Operative delivery	32	42.11
Maternal complication		
Uterine rupture	3	0.9
PPH	15	4.4
Tear	37	10.9
None	285	83.8
New born status at birth		
Alive	324	95.3
Fresh or macerated still birth	16	4.7
APGAR Score		
<7	32	9.4
>7	308	90.6
Weight of new born at birth		
<4000 gm	324	95.3
>4000 gm	16	4.7
Admission to NICU		
Yes	17	5
No	323	95
Perinatal death		
Yes	20	5.9
No	320	94.1

**Table 2:** Obstetrical history of women delivered at Wolliso St. Luke Hospital from November 1, 2014 to October 30, 2015.

**Associated factors for induction of labor**

The rate of induced labor was higher among laboring mother who had not ANC follow-up compared to the other counterpart. And there was statistically significant association between the ANC follow-up and induction of labor ( $X^2=20.36$ ;  $P=0.000$ ).

The higher rate of induced labor (14.41%) was observed in women whose gestational age were less than or equal to 42 weeks. The analysis

Variables	Induced labor (%)	Non-induced labor (%)	$\chi^2(P\text{-value})$
ANC follow-up			
Yes	58 (17.06%)	248 (72.94%)	20.36 (0.000)

indicated that there was statistically significance association observed among the gestational age categories ( $X^2=45.97$ ;  $P=0.000$ ).

Similarly, the result indicated that fetal heart rate abnormality and change of meconium color were another two important factors showed significant association to the induction of labor with chi square and p-value of ( $X^2=84.33$ ;  $P=0.000$ ) and ( $X^2=6.46$ ;  $P=0.011$ ) respectively (Table 4).

**Associated risk factors for the outcomes of induced labor**

The impact of selected socio-demographic and obstetrical characteristics to the outcomes of induced labor was investigated using both bivariate and multivariate logistic regression analysis.

The laboring mother with the gestational age (<42 weeks) show an increase in chance of success for induced labor for about 9.47 times compared to the mothers who had underwent induced labor with gestational age having greater than to 42 weeks (Table 5).

Variables	Frequency	Percentage (%)
ANC follow-up		
Yes	306	90
No	34	10
Gravidity and parity		
Prime gravidity	105	30.9
Multigravidity	235	69.1
Gestational age		
≤ 42	128	37.64
>42	25	7.36
Unknown LMP	187	55
Bishop score		
≤ 5	26	7.6
>5	314	92.4
Reason for induction (n=76)		
Post term	21	27.6
PROM	27	35.5
PIH	16	21
IUFD	12	15.8

**Table 3:** Outcomes of labor among women in Wolliso St. Luke Hospital (n=76).

No	18 (5.30%)	16 (4.71%)	-
Total	76 (22.35%)	264 (77.65%)	
<b>Gravidity</b>			
Primi gravidity	24 (7.06%)	81 (23.82%)	0.022 (0.881)
Multigravidity	52 (15.29%)	183 (53.53%)	-
Total	76 (22.35%)	264 (77.65%)	
<b>Gestational age</b>			
<42	49 (14.41%)	79 (23.24%)	45.97 (0.000)
>42	11 (3.23%)	14 (4.12%)	-
Unknown LMP	16 (4.71%)	171 (50.29%)	
Total	76 (22.35%)	264 (77.65%)	
<b>Bishop Score</b>			
≤ 5	17 (5%)	7 (2.06%)	34.97 (0.000)
>5	59 (17.35%)	257 (75.59%)	-
Total	76 (22.35%)	264 (77.65%)	
<b>Fetal heart beat abnormality</b>			
Yes	52 (15.29%)	253 (74.41%)	84.33 (0.000)
No	24 (7.06%)	11 (3.24%)	-
Total	76 (22.35%)	264 (77.65%)	
<b>Change of meconium</b>			
Yes	61 (17.94%)	254 (74.71%)	6.46 (0.011)
No	15 (4.41%)	10 (2.94%)	-
Total	76 (22.35%)	264 (77.65%)	

**Table 4:** The impact obstetrical variable to induction of labor at Wolliso St Luke Hospital (n=340) ( $\chi^2$ =chi-square).

Variables	Success of Induction			
	Yes	No	COR (95% CI)	AOR (95% CI)
<b>Age</b>				
≤ 24	12	20	4.44 (1.67, 11.79)*	2.85 (0.69, 11.67)
>24	32	12	1	1
<b>Residence</b>				
Urban	16	14	1.09 (0.42, 2.83)	1.10 (0.34, 3.92)
Rural	28	18	1	1
<b>ANC follow-up</b>				
Yes	29	26	2.24 (0.76,6.63)	1.69 (0.34, 8.46)
No	15	6	1	1

Gravidity				
Primigravida	12	12	1	1
Multigravida	32	20	1.6 (0.60,4.25)	1.67 (0.36, 7.82)
Reason for induction				
Post term	10	11	1	
PROM	16	11	1.54 (0.37, 6.45)	2.06 (0.67, 6.34)
PIH	11	5	0.96 (0.24, 3.83)	0.98 (0.33, 4.43)
IUFD	7	5	0.63 (0.13, 3.03)	0.74 (0.23, 3.43)
Gestational age				
≤ 42	33	15	3.85 (1.43, 10.37)*	9.47 (1.41, 69.1)*
>42	10	11	1	1
Membrane rupture before labor				
Yes	16	10	1.26 (0.48, 3.31)	8.01 (1.03, 62.10)*
No	28	22	1	
Mother Bishop				
≤ 5	5	12	1	1
>5	39	20	4.68 (1.45,15.14)*	4.12 (1.89, 19.04)*
Fetal heart beat abnormality				
Yes	35	17	1	1
No	9	15	3.43 (1.25,9.41)*	5.07 (1.23, 20.85)*
Change of meconium				
Yes	36	25	0.67 (0.22, 2.02)	2.30 (0.47, 11.29)
No	8	7	1	1
Apgar Score				
≤ 7	36	18	1	1
>7	8	14	3.50 (1.24, 9.87)*	2.56 (1.55, 11.97)*
Weight of new born				
<4000 gm.	22	12	1.67 ( 0.66, 4.23)	0.60 (0.15, 2.42)
4000 gm.	22	20	1	

**Table 5:** Bivariate and multivariate logistics analysis for factors Associated with outcomes of induced labor in Wolliso St. Luke Hospital from 2014-2015 (n=76)

\*Statistically significant at p-value<0.05

The odds of fetal heart beat abnormality indicated that those fetal who had no fetal heart beat abnormality more likely to be success as compared to the fetus with the presence of fetal heart beat abnormality. The analysis indicated they were 5.07 times more success as compared with those who had the problems (Table 5). Moreover APGAR Score were found to be another determinants factor that showed significant association to the success of induced labor. The newborn who's Apgar score were>7 had 2.52 times more likely to had successful induced

labor than the counter parts who's score was less or equal to 7 (Table 5).

## Discussion

Out of 340 delivery cases reviewed for the study, 76 women were underwent induced labor. This finding indicated that the prevalence of induced labor among women delivered in Wolliso St Luke Hospital was found to be 22.35%. This result is a bit lower when compared to

the developed countries [12]. This might be due to the difference in hospital facilities and setup to the relief of pain associated with the initiation of uterine contraction. However, the prevalence of the current study was high when compared with result reported in Latin America (11.4%) [6]. Moreover, the prevalence was much higher as compared to studies conducted in Africa i.e. Nigeria (3%) [7]. This could be due to variation in commonly used methods for induction of labor and currently Ministry of health in Ethiopia give more emphasis on In this study out of 76 women who undergone induction about 44 (57.89%) women had successful induction. This finding was comparable with study done in Addis Ababa Army Referral Hospital 59.7% [13] and in Kathmandu Medical College Teaching Hospital, Nepal (58.33%) [14].

The result of the current study was much lower to the finding reported by different studies: In Aga Khan Hospital, Pakistan, (81.9%) that revealed an induced labor ended with vaginal delivery [15], King Khalid University Hospital who had registered (84%) of women had vaginal delivery considered as successful outcome of IOL [16]. This discrepancy could be due to the difference in hospital setup, skilled professional and availability of different method for applying induction. The prevalence of induced labor among pregnant mother having ANC visit/not showed significant variation during analysis ( $X^2=20.36$ ;  $P=0.000$ ). This result is in agreement with the result reported by Fawole [17]. This might be due to the increase trend of ANC follow-up by pregnant women and ANC provides helpful information about pregnant women and their fetus and give an entry point to decide on complication in order to improve pregnancy outcomes.

The present study revealed that gestation age was one the factors that yielded significant association to the induction of labor. This finding was in line with the study conducted in Kenya [18] that indicated gestational age was one of the determinants for induction of labor. This could be justified by the induced labor at or beyond 41 weeks of gestation may reduce perinatal mortality and meconium aspiration syndrome. In this study was found that the induced labor had shown significant association with Bishop Score, heart rate abnormality and change of meconium color. This finding was in accordance with the study of Bekana et al. [19] and Fawole et al. [17] who recorded significant associations between those variables and induction of labor. This might be that those variables are the most likely variables indicating the condition of laboring mother and their fetus which are important to determine the need of induced labor.

Various variables that were assumed to be associated with outcomes of induced labor were also assessed first by using bivariate then multivariable logistic regression analysis methods. The current study showed significant association between gestational age, fetal heart beat abnormality, Bishop Score, membrane rapture and APGAR score to the outcomes of induced labor. Women who were in the gestational age <42 weeks showed 9 times more likely to be successful during induced labor as compared to those who were not. This finding was supported by the study done in Aga Khan university Hospital [15] and Hawassa Public health facilities [19]. This may be related to when Gestational age >42 week there will be big fetus (macrosomia) cause Fetopelvic disproportion or there is decreased placental insufficiency perfusion leads to non-reassurance fetal heart beats cause failure to success induction of labor. Moreover, membrane rapture before induction of labor was associated with successful of induced labor. Women who had membrane rapture before induction of labor were more likely to have success when compared with those who had not.

This finding is in line with Hawassa Public health facilities [19]. This could be explained by the presence of membrane rapture strengthen the cascade of uterine contraction and induced labor.

The study revealed that Bishop Score was significantly associated the outcomes of induced labor. Those women who had sishop score >5 were 4.12 times more successful as compared Bishop Score less than 5. This finding is supported with other studies in Addis Ababa Army Hospital [13] and Aga Khan Hospital, Pakistan [15] which found that Bishop Score was one of the important predictors to the outcomes of induced labor. This is due to condition of the cervix (ripening) at the start of induction is an important factors for the success of induced labor.

The study also found that the presence fetal heart beat abnormality was significantly associated with success of induced labor. Cases who had not fetal heart beat abnormality were 5.07 more like to be success during induction of labor in contrast with those with abnormality. This result is in agreement with the research reported in Addis Ababa Army Hospital [17]. This could be due to the fact that the presence of fetal heart beat abnormality could cause fetal distress on the fetus and leads to fetal death and failure of induction. In addition, APGAR score was found to be a significant predictor of induced labor. The newborn who's APGAR score were >7 had 2.52 times more likely to had successful induced labor than the counter parts. This finding is consistent with a study in Latin America [6] and Addis Ababa Army Hospital [13]. This result might be attributed to the fact lower value of APGAR score is mostly related to the occurrence of perinatal death and failure of induced labor.

## Conclusion

Induction of labor is an obstetric intervention usually employed to prevent adverse pregnancy outcomes. Given the increasing attention to reducing perinatal morbidity and mortality, rates of induction of labor have continued to rise over the past few decades. The study revealed that the socio-demographic and obstetrical characteristics such as age, Bishop Score, fetal heart rate abnormality, membrane rapture before labor and APGAR score showed significant association to the success of induced labor.

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